

Passive Wireless Hydrogen Sensors Using Orthogonal Frequency Coded Acoustic Wave Devices, Phase I

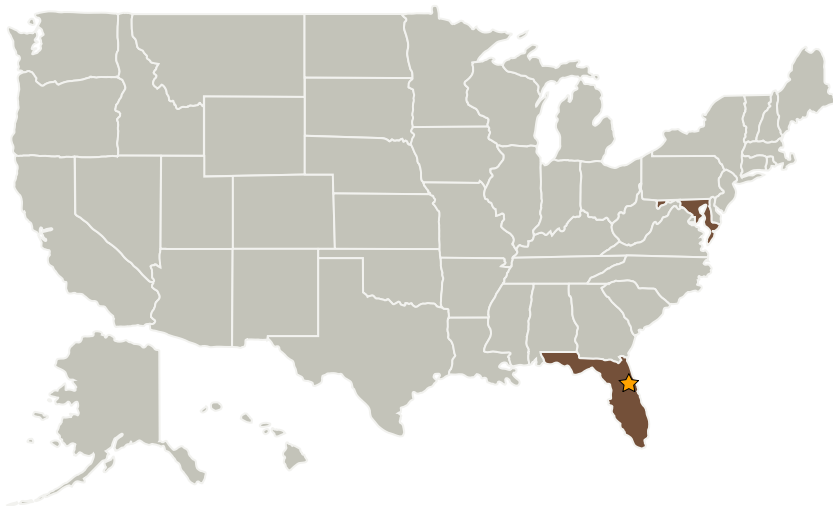
Completed Technology Project (2006 - 2007)



Project Introduction

This proposal describes the development of passive surface acoustic wave (SAW) based hydrogen sensors for NASA application to distributed wireless hydrogen leak detection systems. Orthogonal Frequency Coded (OFC) SAW devices have been demonstrated as passive wireless temperature sensors in NASA Contract NNK04OA28C, and are being further developed under NNK05OB31C. The proposed hydrogen sensors will use a novel OFC SAW device structure, combined with Palladium nanocluster film elements to produce fast, reversible, highly sensitive hydrogen sensors capable of detecting a wide range of hydrogen concentrations at room temperature. The proposed research will utilize results from Argonne National Labs on the formation of Pd nanocluster films on self-assembled siloxane monolayers on glass. These optimized nanocluster films demonstrated hydrogen sensing from 25 ppm to over 2% hydrogen, with response times of milliseconds, complete reversibility, and no baseline drift at room temperature. The films experience large conductivity changes due to the hydrogen induced lattice expansion of the Pd nanoclusters and the quantum nature of conduction in nanocluster films. The performance of the SAW device will change in response to a change in conductivity of this film. Issues including SAM formation on piezoelectric substrates, nanocluster film deposition, and simulation of device performance will be evaluated.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Kennedy Space Center (KSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
SenSanna Incorporated (formerly Applied Sensor Research & Development)	Supporting Organization	Industry Women-Owned Small Business (WOSB), Veteran-Owned Small Business (VOSB)	Arnold, Maryland

Primary U.S. Work Locations

Florida	Maryland
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jacqueline Hines

Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
 - └ TX13.2 Test and Qualification
 - └ TX13.2.7 Test Instruments and Sensors